

(21) Application No 9219310.1

(22) Date of filing 11.09.1992

(30) Priority data

(31) 9205625

(32) 14.03.1992

(33) GB

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G01R 11/04 // G01R 11/24, G07F 15/04

(52) UK CL (Edition L)

G1U UR1104 UR1124

U1S S2134

(56) Documents cited

GB 1005145 A GB 0685244 A

(58) Field of search

UK CL (Edition L) G1D, G1J, G1N, G1R, G1U UR104

UR1104 UR1124, G4V

INT CL<sup>5</sup> G01R 1/04 11/04 11/24

On-line databases: WPI

## (54) Electricity meters

(57) In an electricity meter having a base (10) and a cover (12), two printed circuit boards (34) and (40) Figure 6 are held in place by shouldered pillars (26) extending from the base and cooperating with apertures in the cover through which screws (22, 24) pass into screwthreaded engagement with sockets in the pillars to secure the cover in place. The number of electricity units credited by a card (18) is indicated by an LCD display viewed through a window (16).

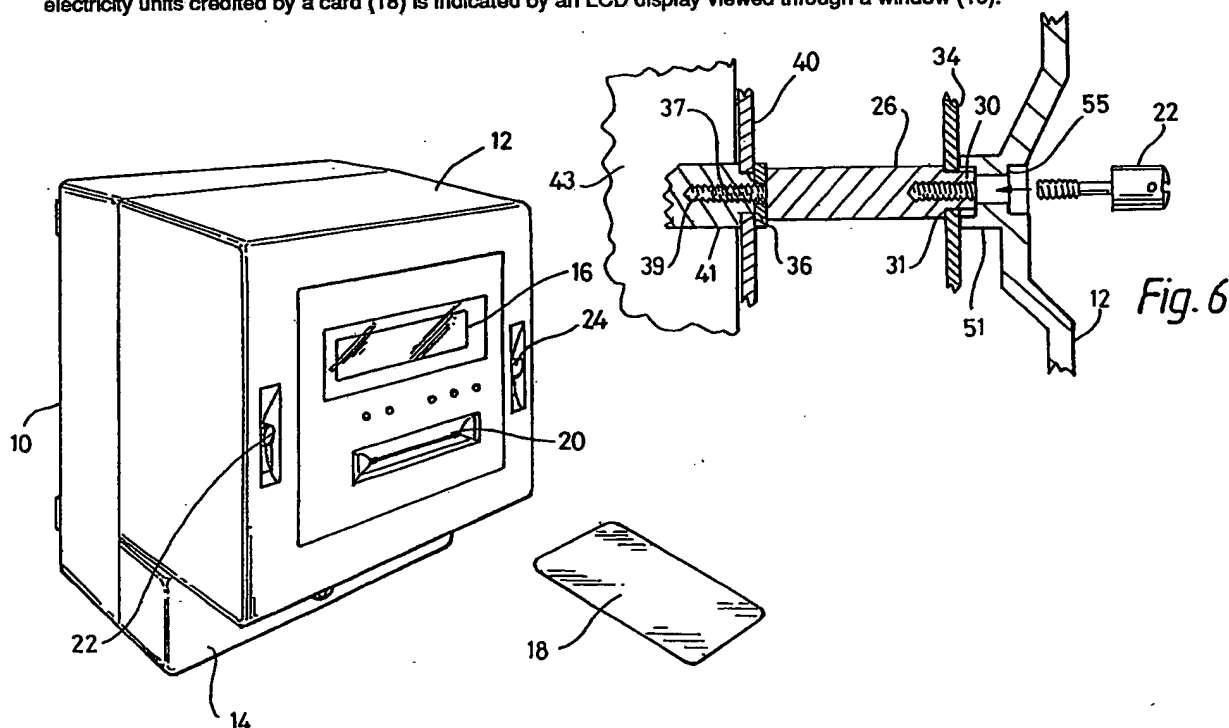


Fig. 1

Fig. 6

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1990.

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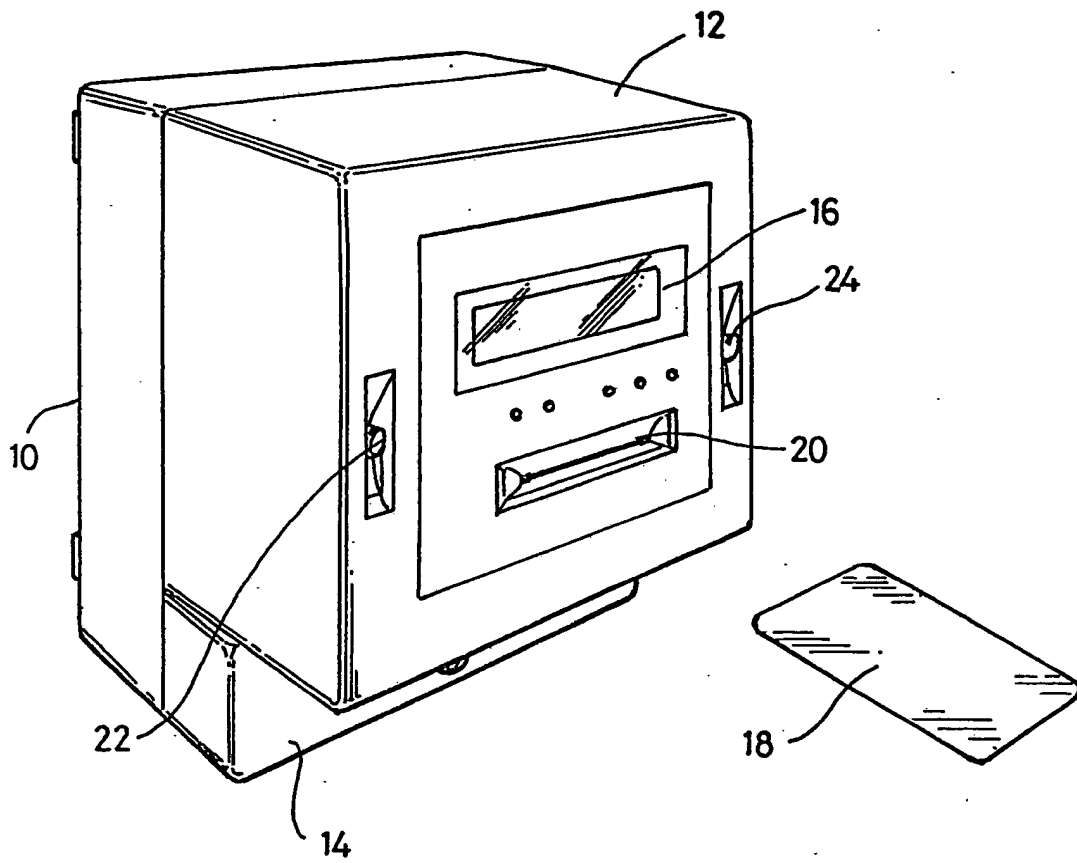


Fig. 1

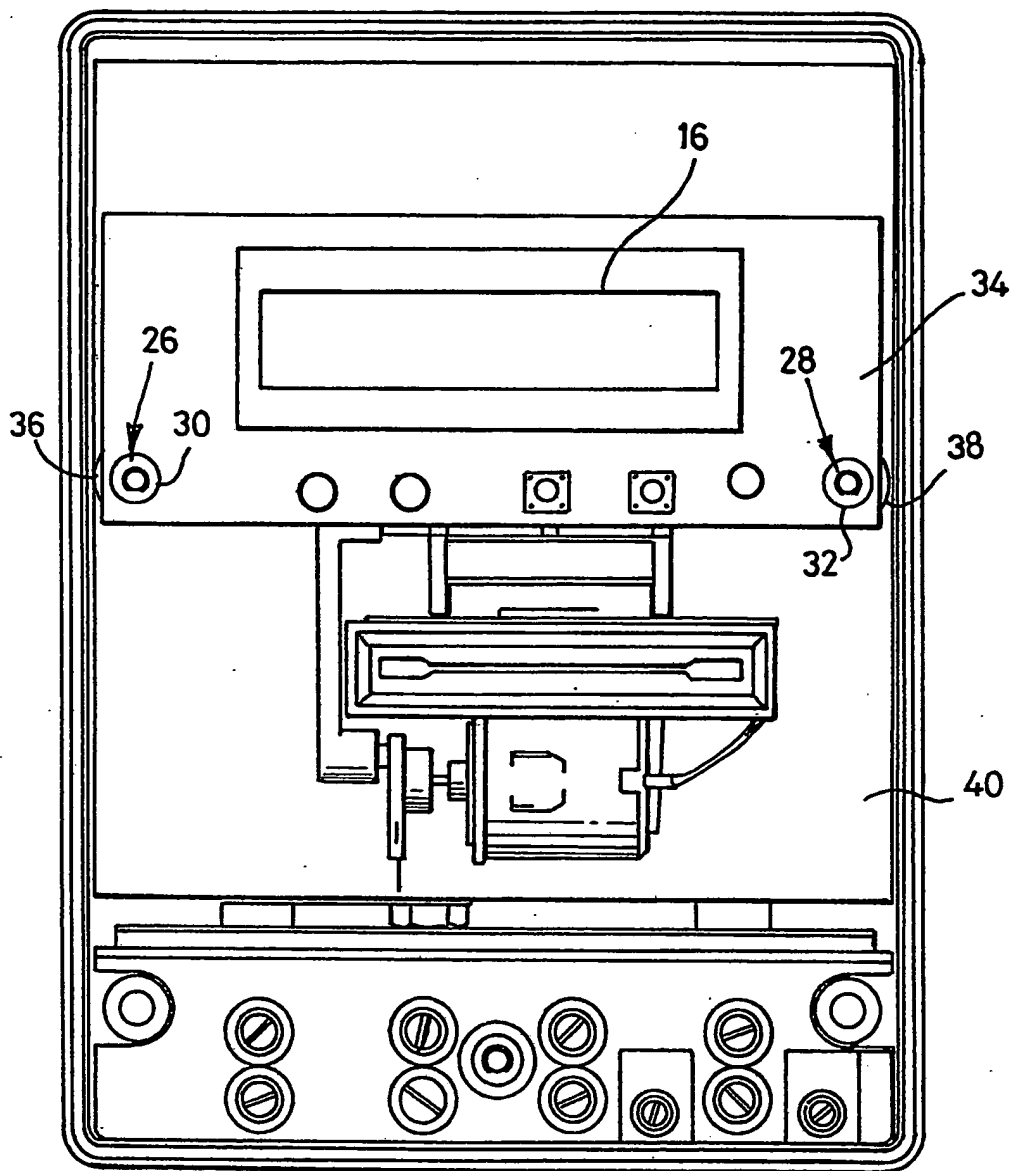
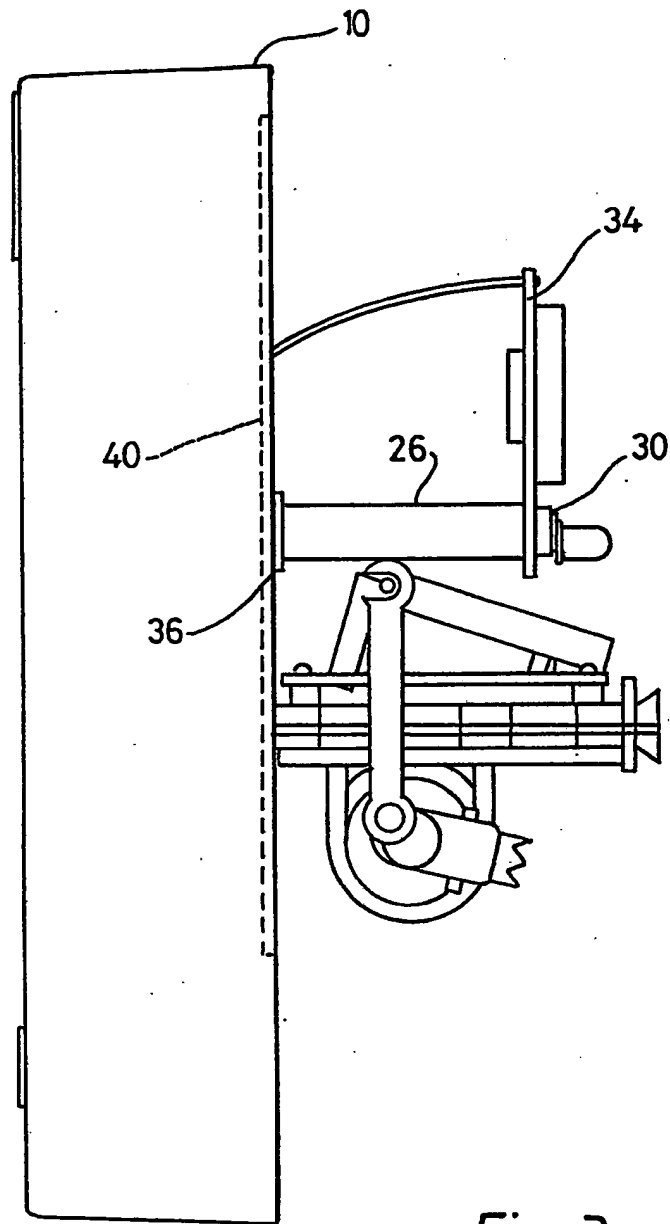


Fig. 2

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*Fig. 3*

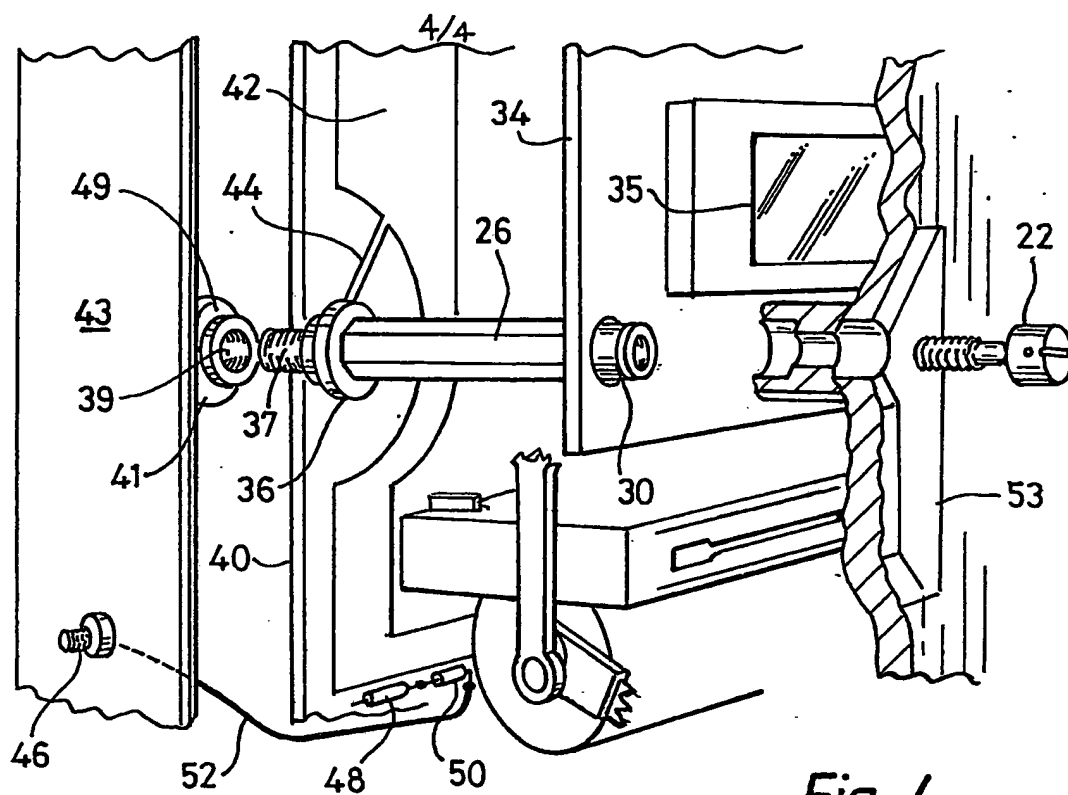


Fig. 4

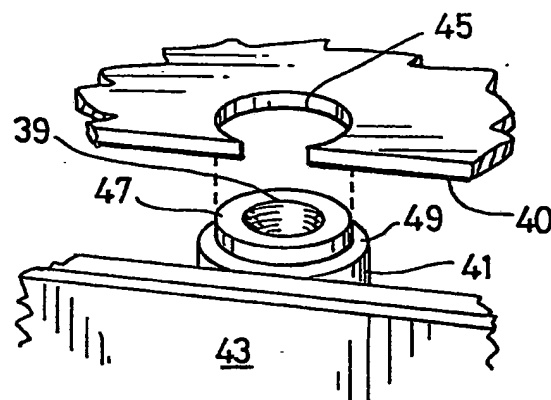


Fig. 5

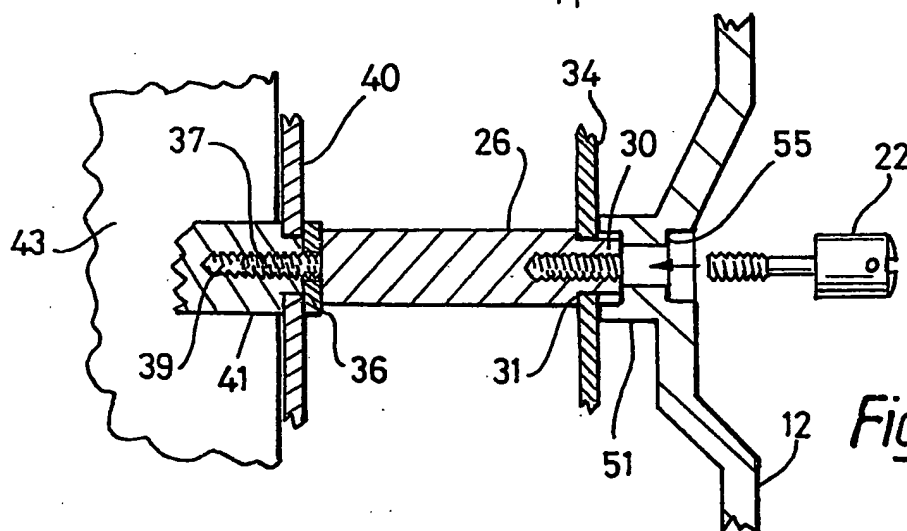


Fig. 6

Title: Improvements in and relating to Electricity  
Meters

Field of invention

This invention concerns housings for meters for metering the supply of electricity typically to domestic premises and the like.

Background to the invention

Housings for electricity measuring meters need to be simple to assemble to keep manufacturing costs low but once assembled, tamper proof to prevent access to non-metered live supply connections.

It is an object of the present invention to provide an improved meter housing which possesses the above features and in which the main housing parts can be secured in place by a pair of screws.

Summary of the invention

According to one aspect of the present invention in a meter in which a cover is secured to a base so as to form a housing for at least one printed circuit board, the cover is apertured to receive screws and pillars which are secured to the base, the upper ends thereof being threaded to receive the screws for securing the cover thereto.

According to a preferred feature of the invention the pillars are threaded at their lower ends for engagement in threaded sockets in the base.

The sockets in the base may be formed in internally projecting protrusions from the side walls thereof.

The lower threaded ends of the pillars may be of reduced diameter so that a shoulder is formed at the lower end of each pillar with a threaded section extending axially therefrom.

According to a further preferred feature of the invention the printed circuit board is apertured and located within the base so that apertures therein align with the threaded sockets in the base and the printed circuit board is held in position between the shoulders of the pillars and the base material surrounding the threaded sockets therein into which the lower ends of the pillars are screwed.

According to a further preferred feature of the invention the upper end of each threaded socket is formed with an annular rebate, the upstanding cylindrical portion remaining having a diameter which enables it to pass through a circular aperture formed in the printed circuit board and the height of the said portion being commensurate with the thickness of the printed circuit board so that the board can be fitted over the protruding end and retained in position therein by screwing the pillar into the threaded socket in the said protruding end until the shoulder of the pillar engages the upper end of the said protruding end and traps the printed circuit board therearound.

Preferably two sockets are provided in the base on opposite sides thereof and two pillars are provided along with the apertures in the housing cover and the printed circuit board includes appropriately positioned and dimensioned apertures, so that the assembly of the pillars to the base as a preliminary to securing the cover to the pillars, also serves to secure the printed circuit board to the base.

An apertured spacer such as a washer may be fitted between the underside of the shoulder at the lower end of the pillar to increase the area over which the printed circuit board is gripped.

According to another aspect of the invention a second printed circuit board may be mounted above the first by attaching the second board to the upper ends of the pillars and sandwiching it between the upper ends of the pillars and the underside of the cover, the latter being retained in position by screws extending through apertures in the cover and the upper printed circuit board, which align therewith, and being screwed into threaded sockets at the upper end of the pillars.

Preferably the upper end of each pillar is provided in a similar way to the upper ends of the threaded sockets in the base, with axially extending reduced diameter protrusions the diameter of which is sufficient to accommodate thereon the apertures in the upper printed circuit board and the apertures in the cover through which the screws extend into the pillars, define an annular shoulder which abuts the upper end of the central protrusion at the upper end of each pillar to trap thereunder the region of the upper printed circuit board



which surrounds the protrusion.

The height of the said protrusion is made somewhat greater than the thickness of the upper printed circuit board and the cover is formed with an annular sleeve which fits over the pillar and which protrudes through the aperture in the printed circuit board and is clamped in place by the act of tightening the screw against the cover as it is screwed at the upper end of the pillar.

The head of each screw is formed with a diametrical passage through which a length of security wire can be passed. By passing the latter through all the screw heads and securing the two ends of the wire together by a metal tag having a low melting point such as lead or a low melting point alloy, so the screws can be prevented from being unscrewed and thereby prevent the cover from being removed, without the wire and tag or both being broken. In this way any tampering with the wire/tag will be revealed simply by inspection.

The cover may be formed with depressions in the region of the apertures through which the screws are to extend for securing to the pillars, the depth of the depressions being sufficient to accommodate the heads of the screws.

A display device such as a liquid crystal display (LCD) may be carried by the upper printed circuit board.

A card reader may be carried by the lower printed circuit board in which event the cover includes an aperture which registers with the mouth of the card reader to enable cards to be inserted into and removed from the reader.

The invention will now be described by way of example, with reference to the accompanying drawings in which:

Figure 1 is a general view of an electricity meter which will supply electricity in response to the insertion of an appropriate pre-paid card,

Figure 2 is a plan view of the inside of the meter with the top cover removed,

Figure 3 is a side view on the arrow X of Figure 2,

Figure 4 is a perspective view of part of the assembly of Figures 2 and 3 showing how a pillar secures and supports printed circuit boards within the meter, in accordance with the invention,

Figure 5 is an enlarged scrap view showing the fitting of an apertured edge region of the lower printed circuit board over a base socket, and

Figure 6 is a cross section through the assembled base and cover showing how the pillar extends therebetween and traps upper and lower printed circuit boards in place.

#### Detailed description of drawings

In Figure 1 the meter is shown as a two part housing comprising a base 10 and a cover 12. A second cover 14 is provided below the main cover 12 to protect the terminals to which the cables are connected.

In the main cover 12 is a window 16 through which an LCD display can be viewed for example to enable a user to

determine the number of electricity units which have been credited on the insertion of a card such as 18 into the slot 20.

The cover 12 is secured in position by means of two screws 22 and 24 which threadedly engage in two brass pillars shown at 26 and 28 in Figure 2. The left hand one 26 can be seen in Figure 3.

The upper end of each pillar 26 (28) is in fact formed with a shoulder such as 31 as shown in Figure 6 and an upper region 30 (31) beyond, of reduced diameter protrudes through appropriately apertured holes such as 33 in an upper printed circuit board 34 which carries a display assembly 35 which can be viewed through the window 16.

At its lower end each of the brass pillars such as 26 is formed with a reduced diameter threaded section 37 for engagement in an appropriately threaded aperture 39 in an internal protrusion 41 moulded integrally with the wall 43 of the base 10. Washers 36 and 38 are sandwiched between the lower shoulders of the pillars 26 and 28 and a lower printed circuit board 40 thereby securing the latter in position on top of two internal protrusions such as 41 in the base 10.

The casing is typically formed from an electrically insulating material such as a polycarbonate.

The construction of the pillars and securing screws etc. is more clearly shown in Figure 4 in which the pillar 26 is shown together with the cover retaining screw 22 in an exploded perspective view containing the base 10, lower printed circuit board 40 and upper printed circuit board

34.

As best seen in Figure 5 the lower printed circuit board 40 is cut away at 45 to define a generally circular opening which is a snug fit over the protruding central upper end 47 of the shoulder protrusion 41. The height of the end 47 is commensurate with the thickness of the board 40 (see Figure 6) and a washer 36 serves to trap the board 40 against the shoulder 49 (see Figure 5) when the pillar 26 is screwed into the threaded socket 39 in the protrusion 41.

At the upper end of the pillar 26 the shoulder 31 traps the upper board 34 which is secured in place by the annular of material at the end of the cylindrical protrusion 51 in the cover 12 through which the screw 22 can pass. The underside of the enlarged head of the screw 22 engages the shoulder 55 in the cover to hold the cover in place against the upper board 34.

In accordance with the invention the pillars 26, 28 and associated screws 22, 24 not only serve to secure the cover 12 to the base 10 but also trap the upper and lower printed circuit boards 34 and 40 in place.

Claims

1. A utility meter in which a cover is secured to a base so as to form a housing for at least one printed circuit board, the cover is apertured to receive screws and the outer ends of pillars which are secured to the base, the outer ends of the pillars being threaded to receive the screws for securing the cover thereto.

2. A meter according to claim 1, wherein the pillars are threaded at their inner ends for engagement in threaded sockets in the base.

3. A meter according to claim 2, wherein the sockets in the base are formed in internally projecting protrusions from side walls of the base.

4. A meter according to claim 2 or claim 3, wherein the inner threaded ends of the pillars are of reduced diameter so that a shoulder is formed at the inner end of each pillar with a threaded section extending axially therefrom.

5. A meter according to claim 4, wherein the printed circuit board is apertured and located within the base so that apertures therein align with the threaded sockets in the base and the printed circuit board is held in position between the shoulders of the pillars and the base material surrounding the threaded sockets therein into which the inner ends of the pillars are screwed.

6. A meter according to claim 5, wherein the outer end of each threaded socket is formed with an annular rebate, the upstanding cylindrical portion remaining having a diameter which enables it to pass through a circular aperture formed in the printed circuit board and the height of the said portion being commensurate with the thickness of the printed circuit board so that the board can be fitted over the upstanding portion and retained in position therein by screwing the pillar into the threaded socket until the shoulder of the pillar engages the end of the said upstanding portion and traps the printed circuit board therearound.

7. A meter according to claim 5 or claim 6, wherein two sockets are provided in the base on opposite sides thereof and two pillars are provided along with the apertures in the housing cover and the printed circuit board includes appropriately positioned and dimensioned apertures, so that the assembly of the pillars to the base, as a preliminary to securing the cover to the pillars, also serves to secure the printed circuit board to the base.

8. A meter according to claim 7, wherein an apertured spacer is fitted between the underside of the shoulder at the inner end of each pillar to increase the area over which the printed circuit board is gripped.

9. A meter according to claim 7 or claim 8, wherein a second printed circuit board is mounted by attaching the second board to the outer ends of the pillars and sandwiching it between the outer ends of the pillars and the inside of the cover, the screws which secure the cover extending through aligned apertures in the cover and the second printed circuit board to engage into threaded

sockets at the outer end of the pillars.

10. A meter according to claim 9, wherein the outer end of each pillar is provided with axially extending reduced diameter protrusions the diameter of which is sufficient to accommodate thereon the apertures in the second printed circuit board, and the apertures in the cover, through which the screws extend into the pillars, define an annular shoulder which abuts the end of the protrusion at the outer end of each pillar to trap thereunder the region of the second printed circuit board which surrounds the protrusion.

11. A meter according to claim 10, wherein the height of the said protrusion is made somewhat greater than the thickness of the second printed circuit board and the cover is formed with an annular sleeve which fits over the pillar and which protrudes through the aperture in the printed circuit board and is clamped in place by the act of tightening the screw against the cover as it is screwed at the outer end of the pillar.

12. A meter according to claim 11, wherein the head of each screw is formed with a diametrical passage through which a length of security wire can be passed.

13. A meter according to claim 12, in which the security wire is passed through all the screw heads and the two ends of the wire are secured together by a metal tag, so the screws cannot be unscrewed to enable removal of the cover without the wire and tag or both being broken.

14. A meter according to any of claims 1 to 13, wherein the cover is formed with depressions in the region of the

apertures through which the screws extend for securing to the pillars, the depth of the depressions being sufficient to accommodate the heads of the screws.

15. A meter according to any of claims 1 to 14, having a liquid crystal display (LCD) carried by the second printed circuit board to be visible through an aperture in the cover.

16. A meter according to any of claims 1 to 15, having a card reader carried by the first printed circuit board, the cover including an aperture which registers with the mouth of the card reader to enable cards to be inserted into and removed from the reader.

17. A utility meter substantially as hereinbefore described with reference to the accompanying drawings.



**Patents Act 1977**  
**E-aminer's report to the Comptroller under**  
**Section 17 (The Search Report)**

12

Application number

GB 9219310.1

**Relevant Technical fields**

(i) UK CI (Edition L ) G1U UR104 UR1104 UR1124;  
G1D; G1J; G1N; G1R; GAV

(ii) Int CI (Edition 5 ) G01R 1/04 11/04 11/24

**Databases (see over)**

(i) UK Patent Office

(ii) ONLINE DATABASES: WPI

**Search Examiner**

K F J NEAL

**Date of Search**

6 APRIL 1993

Documents considered relevant following a search in respect of claims 1-17

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
X	GB 1005145 A (LANDIS) Note lines 46-49, page 2	1
X	GB 0685244 A (GEC) Note 15, 16, Figures 1, 2	1

Category	Identity of document and relevant passages	Relevant to claim(s)

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